

Assessment of uncertainties and QA/QC procedures in the Dutch GHG Inventory Report

Assessment of uncertainties and QA/QC procedures in the Dutch GHG Inventory Report

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Summary

In the last UNFCCC reviews of the Dutch national inventory report of Greenhouse Gas Emissions in the Netherlands (NIR), the review team recommended to better describe the actions related to sector specific uncertainty estimates and sector specific Quality Assurance (QA) / Quality Control (QC) procedures.

SenterNovem (since January 1st, 2010 changed into NL Agency) commissioned Ecofys to assist them in following up this recommendation. To this end, workshops and interview sessions were organized with the key persons involved in preparing the emission estimates for the various sectors in the NIR. This report gives a general overview of the outcome of the discussions at these meetings and a list of concrete action points that may be considered in the near future to improve the NIR and the documentation to the NIR with respect to the uncertainty estimates and sector-specific QA/QC procedures. These action points include making the uncertainty estimates used in the NIR up-to-date (i.e. in line with currently applied methodology to estimate emissions), better describing past and current QA/QC activities that have taken place and further improve the comparison with default uncertainty estimates recommended by the IPCC good practice guidance.

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1 Introduction

In the last UNFCCC reviews of the National Inventory Report (NIR) of Greenhouse Gas Emissions in the Netherlands, the review team recommended on improving the description of:

- The uncertainty estimates of emission categories in the NIR
- Sector specific Quality Assurance / Quality control (QA/QC) procedures in the NIR

In the individual review report of 2007 (UNFCCC, 2007), UNFCCC reviewers for example concluded that:

"some of the basic uncertainty data could be overestimated and inconsistent with the methodology to estimate the emissions of some sectors (expert judgement was used for measured emissions in the industrial processes sector) and could be updated".

About the sector-specific QA/QC procedures, they conclude that:

"no information on the QC sectoral procedures is reported in the NIR for each sector or in the monitoring protocols."

The UNFCCC reviewers recommended updating the uncertainty estimates while paying special attention to the way they are calculated and to describe and further improve the sector-specific QA/QC procedures.

Following the recommendation of the UNFCCC reviews, SenterNovem is aiming to:

- Better describe in the NIR and the protocols underlying the NIR the uncertainty estimates that are currently used in the NIR uncertainty analysis and the sources for these estimates and to explore ways to further improve uncertainty estimates.
- Better describe in the NIR and the protocols underlying the NIR the sector-specific QA/QC actions currently undertaken and investigate possible further sector specific QA/AC actions.

SenterNovem commissioned Ecofys to assist it in setting up an approach to do so and to provide guidance. In cooperation with SenterNovem, Ecofys organized two workshops for respectively the Common Reporting Format (CRF) sectors 'energy' (with exception of 'transport' and 'industrial processes' and the CRF sectors 'agriculture' and

'land use, land change and forestry'. These workshops were attended by the key persons involved in uncertainty analysis and sector-specific QA/QC procedures. The CRF sectors 'transport' (part of 'energy') and 'waste' were considered by means of meetings with key people involved in the preparation of the sections in the NIR on these sectors. The goal of the meetings was to convey the conclusions of the workshops held for other sectors and to discuss the relevance of those conclusions for the CRF sectors 'transport' and 'waste'.

This report consists of the following parts:

- Approach for assessment of sector-specific QA/QC procedures and uncertainty analyses (Chapter 2).
- Preparation documents for the workshops (Chapter 3 and 4), consisting of two parts:
 - A description of the key sources on uncertainties and sector-specific QA/QC procedures for the selected chapters
 - A list of questions for use by the invitees to the workshop
- Reports on the two workshops (Chapter 5 and 6) and the meetings on transport and waste (Chapter 7 and 8). The key findings and action points are summarised. The reports reflect the full content of the discussion. In view of available resources and time for the preparation of the Dutch national inventory report, it is not feasible and possible to follow-up on all opportunities for improvement identified. Therefore, the summary of action points only contains actions that in view of feasibility and priority, were agreed to perform in the year following the publication of the NIR 2010.

2 Approach for assessment of sector-specific QA/QC procedures and uncertainty analyses

In this Chapter, first a brief overview is given of the sector-specific QA/QC procedures and uncertainty analyses performed as part of the National System of monitoring GHG emission (section 2.1). In Section 2.2, the approach is presented for considering the sector-specific QA/QC procedures and uncertainty analyses for different sectors.

2.1 Brief overview of sector-specific QA/QC procedures and uncertainty analyses in the NIR

Following UNFCCC guidelines, the National Inventory Report reports GHG emission in seven different main sectors:

1. Energy (CRF sector 1)
2. Industrial Processes (CRF sector 2)
3. Solvent and other product use (CRF sector 3)
4. Agriculture (CRF sector 4)
5. Land use, land change and forestry (CRF sector 5)
6. Waste (CRF sector 6)
7. Other (CRF sector 7)

In the NIR, general QA/QC procedures (tier 1) as well as source/sink category specific procedures (tier 2) are applied. The QA/QC programme is described in Section 1.6 of the NIR.

The evaluation of uncertainty is described in Section 1.7 of the NIR. Each year, the IPCC tier 1 methodology is applied to obtain an estimate of the uncertainties in the annual emissions as well as in the trends. The tier 1 methodology is described in Olivier and Brandes (2009) and uses standard error propagation rules and a normal Gaussian distribution of uncertainties. Every five years, a Tier 2 uncertainty analysis is conducted, taking into account correlations between emission sources and non-Gaussian distributions. The last two tier 2 uncertainty analyses are those described by Olsthoorn and Pielaat (2002) and Ramirez et al. (2006). The latter study reveals that Tier 1 and Tier 2 uncertainty estimates are in the same order of magnitude, although a higher trend uncertainty is found (NIR, 2009, Section 1.7.3).

In table A1.1 of each NIR a key source list is given. These key sources are identified by a tier 1 level and trend assessment (not taking into account uncertainties) and a tier 2 level and trend assessment that do take into account the uncertainty estimate.

2.2 Assessment of sector-specific QA/QC procedures and uncertainty analyses for different sectors

Energy (CRF sector 1) contains almost half of all key sources identified in both the tier 1 and tier 2 key source analysis. Also, this sector was responsible for 81% of GHG emissions in 2007 and also contributes most to the trend in emissions compared to the base year (NIR, 2009, Section 2.3). The energy sector is closely linked to industrial processes (CRF sector 2) (i.e. the industrial processes that result in process emissions also lead to energy emissions and in many cases similar datasets are used). Given the linkage between the energy sector and the industrial processes, a workshop for both sectors together was organized in order to optimize synergy.

A somewhat separate sub-category in the Energy sector is the category transport (CRF sector 1A3) because the transport sector is dealt with by different people and using different datasets. The transport emissions were dealt with via a meeting with key people involved in the preparation of the section in the NIR on this sector. The goal of that meeting was to convey the conclusions of the workshops held for other sectors and to discuss the relevance of those conclusions for the sub-category transport.

Sector 3 (Solvent and other product use) contains no key level or trend source. The sector has a limited contribution the level and trend of greenhouse gas emissions in the Netherlands. We therefore did not meet with the people involved in the preparation of the section in the NIR on this sector. Instead we assessed the relevance of the conclusions of the workshops held for other sectors based on the background document on uncertainties (Olivier et al. 2009) and the sector on uncertainties in the NIR 2009.

The Agriculture (CRF sector 4) and Land Use, Land Use Change and Forestry sectors (CRF sector 5) are sectors with very specific characteristics. Methodologies for estimating emissions for the relevant source categories in this sector have little analogy with any of the methodologies used in the energy sector or industrial processes sector. Uncertainties and sector-specific QA/QC procedures in the NIR for these sectors were therefore discussed in a separate workshop.

Sector 6 (Waste) contains two key level or trend source. Given their limited contribution the level and trend of greenhouse gas emissions in the Netherlands and the relative small number of source/sink categories in this sector, the uncertainty

estimates and sector-specific QA/QC procedures for these sectors were assessed by means of a meeting with key people involved in the preparation of the section in the NIR on this sector. The goal of that meeting was, similar to the meeting with the key persons involved in estimating emissions from transport, to convey the conclusions of the workshops held for other sectors and to discuss the relevance of those conclusions for the sub-category waste.

Sector 7 (Other): The Netherlands allocates all emissions in Sectors 1 to 6; there are no sources of greenhouse gas emissions included in Sector 7

Summarizing, the following set-up for assessing the uncertainty estimates and sector-specific QA/QC procedures in the sectors included in the NIR was chosen:

1. Energy (CRF sector 1) - *Workshop 1 – 29 June 2009*
 - (1) Sub-category Transport (1A3) - *No workshop, assessment via a meeting with relevant people – 5 February 2010*
2. Industrial Processes (CRF sector 2) – *Workshop 1 – 29 June 2009*
3. Solvent and other product use (CRF sector 3) – *Assessment based on background document and section on uncertainties in the NIR*
4. Agriculture (CRF sector 4) – *Workshop 2 – 4 November 2009*
5. Land use, land change and forestry (CRF sector 5) – *Workshop 2 – 4 November 2009*
6. Waste (CRF sector 6) – *No workshop, assessment via a meeting with relevant people – 14 January 2010*
7. Other (CRF sector 7) – *No emissions in this sector*

3 Workshop preparation for CRF Sector 1 (energy) and 2 (industrial processes)

3.1 Requested input regarding uncertainty estimates and sector-specific QA/QC procedures

Attendees were asked to provide input in their preparation for the workshop (Section 3.1.1 and 3.1.2). This input was also used to develop the agenda for the workshop.

3.1.1 Uncertainty estimates

Regarding the TIER 1 uncertainty estimates for energy (CRF 1) and industrial process (CRF 2) emissions in the National Inventory Report, the following sources are available:

For CRF 1 and CRF 2:

1. Section 1.7 of the NIR: general information on uncertainty estimates (NIR, 2009)
2. Table A7-2: emission factor uncertainty estimates (NIR, 2009)
3. Table A7-2: activity data uncertainty estimates (NIR, 2009)
4. Olivier et al. (2009): background documentation
5. Chapter 6 of the IPCC good practice guidance and uncertainty management in national greenhouse gas inventories (IPCC, 2001)

Only for CRF 1:

6. Chapter 3 in the NIR: specific issues related to uncertainties for the energy emissions (NIR, 2009)
7. Chapter 2 of the IPCC good practice guidance and uncertainty management in national greenhouse gas inventories (IPCC, 2001)

Only for CRF 2:

8. Chapter 4 in the NIR: specific issues related to uncertainties for the industrial process emissions (NIR, 2009)
9. Chapter 3 of the IPCC good practice guidance and uncertainty management in national greenhouse gas inventories (IPCC, 2001)

Additional information on uncertainties can be found in the 2002 and 2006 TIER 2 uncertainty analyses by Olsthoorn and Pielaat (2002) and Ramirez et al. (2006).

With help of the nine sources listed above, attendees to the workshop were asked to provide the following input using the template in Appendix A. Please note that A.1 to A.4 focus on estimating the uncertainties using the current methodologies for estimating emissions whereas A.5 focuses on decreasing the uncertainties by changing the methodologies for estimating emissions

A. Requested input regarding uncertainty estimates

- A.1 List those uncertainty estimates in Table A7-2 (CRF Sector 1 and 2) for which it is not clear from the documentation (Olivier et al., 2009) what the source for the uncertainty estimate is or whether the description can be made more precise.
- A.2 List the source of the uncertainty estimate (additional to Olivier et al., 2009) if known by you.
- A.3 Indicate uncertainty estimates that, in your opinion, are no longer up-to-date, for example if the uncertainty estimate description refers to a methodology for estimating the emissions that is no longer used.
- A.4 List those uncertainty estimates that you think can be improved, for instance if the method for estimating the uncertainty (e.g. expert judgement) is not in line with the methods to determine the emissions (e.g. measurements).
- A.5 List those source categories for which, in your opinion, the uncertainty can be reduced by changing the methodology for estimating emissions from this source category.

3.1.2 Sector-specific QA/QC procedures

Regarding the sector-specific QA/QC procedures, the following sources are available:

For CRF 1 and CRF 2:

1. Section 1.6 of the NIR: general information on the QA/QC plan (NIR, 2009)
2. Chapter 8 of IPCC good practice guidance and uncertainty management in national greenhouse gas inventories (IPCC, 2001)

Only for CRF 1:

3. Chapter 3 in the NIR: specific issues related to QA/QC procedures for the energy emissions (NIR, 2009)

4. Chapter 2 of IPCC good practice guidance and uncertainty management in national greenhouse gas inventories (IPCC, 2001)

Only for CRF 2:

5. Chapter 4 in the NIR: specific issues related to sector-specific QA/QC procedures for the industrial process emissions (NIR, 2009)
6. Chapter 3 of IPCC good practice guidance and uncertainty management in national greenhouse gas inventories (IPCC, 2001)

With help of these six sources, attendees to the workshop were asked to provide the following input using the template in Appendix B. Please note that B.1 and B.2 focus on describing the current sector-specific QA/QC procedures whereas B.3 focuses on possible additional sector-specific QA/QC activities.

B. Requested input regarding QA/QC procedures

- B.1 List the sector-specific QA/QC activities for which the description is not up-to-date or for which the description can otherwise be improved.
- B.2 List the sector-specific QA/QC activities that are undertaken, but that are not described in the sources given.
- B.3 List additional sector-specific QA/QC procedures that you think could be useful for the considered sources.

4 Workshop preparation for CRF Sector 4 (agriculture) and CRF sector 5 (LULUCF)

4.1 Requested input regarding uncertainty estimates and sector-specific QA/QC procedures

Attendees were asked to provide input in their preparation for the workshop (Section 4.1.1 and 4.1.2). This input was also used to develop the agenda for the workshop.

4.1.1 Uncertainty estimates

Regarding the TIER 1 uncertainty estimates for agriculture (CRF sector 4) and Land use, land use change and forestry (CRF sector 5) emissions in the National Inventory Report, the following sources are available:

For CRF 4 and CRF 5:

1. Section 1.7 of the NIR: general information on uncertainty estimates (NIR, 2009)
2. Table A7-2 and A7-3: emission factor uncertainty estimates (NIR, 2009)
3. Table A7-2 and A7-3: activity data uncertainty estimates (NIR, 2009)
4. Olivier et al. (2009): background documentation

Only for CRF 4:

5. Chapter 6 in the NIR: specific issues related to uncertainties for the agriculture emissions (NIR, 2009)
6. Chapter 4 of the IPCC good practice guidance and uncertainty management in national greenhouse gas inventories (IPCC, 2001)
7. Chapter 6 of the IPCC good practice guidance and uncertainty management in national greenhouse gas inventories (IPCC, 2001)

Only for CRF 5:

8. Chapter 7 in the NIR: specific issues related to uncertainties for land use, land use change and forestry (NIR, 2009)
9. The IPCC good practice guidance and uncertainty management in national greenhouse gas inventories for Land Use, Land Use Change and Forestry (IPCC, 2003)

Additional information on uncertainties can be found in the 2002 and 2006 TIER 2 uncertainty analyses by Olsthoorn and Pielaat (2002) and Ramirez et al. (2006).

With help of the nine sources listed above, attendees to the workshop were asked to provide the following input using the template in Appendix A. Please note that A.1 to A.4 focus on estimating the uncertainties using the current methodologies for estimating emissions whereas A.5 focuses on decreasing the uncertainties by changing the methodologies for estimating emissions

A. Requested input regarding uncertainty estimates

- A.1 List those uncertainty estimates in Table A7-2 (CRF Sector 4) and Table A7-3 (CRF Sector 5) for which it is not clear from the documentation (Olivier et al., 2009) what the source for the uncertainty estimate is or whether the description can be made more precise.
- A.2 List the source of the uncertainty estimate (additional to Olivier et al., 2009) if known by you.
- A.3 Indicate uncertainty estimates that, in your opinion, are no longer up-to-date, for example if the uncertainty estimate description refers to a methodology for estimating the emissions that is no longer used.
- A.4 List those uncertainty estimates that you think can be improved, for instance if the method for estimating the uncertainty (e.g. expert judgement) is not in line with the methods to determine the emissions (e.g. measurements).
- A.5 List those source categories for which, in your opinion, the uncertainty can be reduced by changing the methodology for estimating emissions from this source category.

4.1.2 Sector-specific QA/QC procedures

Regarding the sector-specific QA/QC procedures, the following sources are available:

For CRF 4 and CRF 5:

1. Section 1.6 of the NIR: general information on the QA/QC plan (NIR, 2009)

Only for CRF 4:

2. Chapter 3 in the NIR: specific issues related to QA/QC procedures for the agriculture emissions (NIR, 2009)

3. Chapter 2 of IPCC good practice guidance and uncertainty management in national greenhouse gas inventories (IPCC, 2001)
4. Chapter 8 of IPCC good practice guidance and uncertainty management in national greenhouse gas inventories (IPCC, 2001)

Only for CRF 5:

5. Chapter 4 in the NIR: specific issues related to sector-specific QA/QC procedures for the Land Use, Land Use Change and Forestry emissions (NIR, 2009)
6. The IPCC good practice guidance and uncertainty management in national greenhouse gas inventories for Land Use, Land Use Change and Forestry (IPCC, 2003)

With help of these six sources, attendees to the workshop were asked to provide the following input using the template in Appendix B. Please note that B.1 and B.2 focus on describing the current sector-specific QA/QC procedures whereas B.3 focuses on possible additional sector-specific QA/QC activities.

B. Requested input regarding QA/QC procedures

- B.1 List the sector-specific QA/QC activities for which the description is not up-to-date or for which the description can otherwise be improved.
- B.2 List the sector-specific QA/QC activities that are undertaken, but that are not described in the sources given.
- B.3 List additional sector-specific QA/QC procedures that you think could be useful for the considered sources.

5 Proceedings of the workshop for CRF Sector 1 (Energy) and 2 (Industrial processes)

5.1 Attendees at the workshop

Inventory Team

Dick Both (SenterNovem)

Peter Zijlema (SenterNovem)

Harry Vreuls (SenterNovem)

Kees Peek (PBL)

Wim van der Maas (PBL)

Dirk Wever (PBL)

Romuald te Molder (PBL)

Bas Guis (CBS)

Consultants

Maarten Neelis

Paul Blinde

5.2 Agenda

The following agenda was followed in the workshop:

09:15 – 09:30	Opening and introduction
09:30 – 09:50	Uncertainty assessments and sector-specific QA/QC in the NIR - IPCC guidance and execution in the Netherlands for CRF 1 (Energy) and 2 (Industrial Process Emissions), presentation Maarten Neelis
09:50 – 10:15	Uncertainty Estimates and QA/QC procedures in the NIR of the Netherlands, Flanders and Germany, presentation Paul Blinde
10:15 – 10:30	Coffee break
10:30 – 11:15	Indicative proposals for improvements: description and updating of present methods

- 11:15 – 12:15 Indicative proposals for improvements: additional sector-specific QA/QC actions and improving uncertainty estimates
- 12:15 – 12:30 Conclusion and future actions

5.3 Presentations

The presentations as given by Maarten Neelis and Paul Blinde are included as Appendix C and D respectively

5.4 Discussion on indicated improvements

In the discussion, the indicated improvements in the presentation by Maarten Neelis were discussed. The overview below reflects this discussion. Agreed action points are listed in Section 5.5.

1. Make description of uncertainties complete, up-to-date (reflecting the actual emission estimate methodologies) and improve description of QA/QC procedures
2. Follow-up of improvement project national fuel list
3. Consider further use of bottom-up data (from e.g. the EU ETS)
4. Include trend analyses as QC activity at the lowest level
5. Update and extend checking the QA/QC procedures for secondary sources used in the NIR
6. Check the uncertainties as given in Olivier et al. with the IPCC Good Practice Guidance
7. Further improve the check between Reference Approach and Sectoral Approach and the description thereof
8. Consider updating data for the N₂O emission factors for fuels

Most attention was given to improving the description of uncertainties and QA/QC procedures (first point). Below we summarize the key points discussed:

1 Make description of uncertainties and QA/AC procedures complete and up-to-date

- There was consensus that it would be good if the protocols would contain information on how the uncertainty for source categories was estimated under a separate heading “uncertainty estimates”. The publication by Olivier et al. (2009)

that is now in print (and will not be changed) can be an important reference in these sections. A more detailed approach will be worked out for updating the protocols ensuring that:

- The exact reference for the uncertainty estimate is included
 - The uncertainty estimate reflects the type of source (estimated, calculated, measures) used
 - The uncertainty estimate is in line with the Good Practice Guidance or deviations can be explained
 - Possible improvements in the uncertainty estimates are taken into account (e.g. involving the experts that can best estimate the uncertainty)
- In line with the overall strategy in the NIR process, the protocols should be year-robust and data regarding specific years only should be put in the NIR. The NIR can also report changes in the protocols and deviations from the protocol.
 - There was also consensus that in each protocol a section "QA/QC" should be added containing partly information that is currently also already in the protocol. Also for these sections, a more detailed approach will be worked out similar to the one on uncertainties.
 - It will be considered to include in the NIR a table with the key QA/QC actions per source category including an indication whether the action is taken and by whom (comparable to the once in NIR of Belgium and Germany). This will be done as part of action point 1 (see below).
 - There was consensus that the QA/QC program of the NIR and the PRTP annual activity program should either be made public or that the reference list should make clear how these documents could be found.

2 Follow up of project to update the national fuel list

- Maarten Neelis indicated that in 2007, a project was done on possible improvement to the national fuel list. This QA/QC action cannot be found in the NIR and it is also unclear which actions have been taken into account.
- Dick Both indicated that he will include some lines on this project in the NIR 2010 and will check which actions from this project are still open.

3 Consider further use of bottom-up data (e.g. from EU-ETS)

- Several attendants to the workshop indicated that it is not straightforward to use EU ETS data; The data at the highest level of detail (the emission reports) is not publically available. Since this bottom-up data replaces top-down data from the energy balance, this detailed data is needed to actually make use of the data,

especially because not all emissions are monitored for the EU ETS and the system boundary therefore differs from the NIR.

- For EU ETS data, emission monitoring aims to keep uncertainties within limits. The way of monitoring therefore also depends on the magnitude of the emissions. In view of the above, it is not straightforward to directly make use of this information in the NIR.
- The annual check between EU ETS data, MJV data and energy statistics data indicates that no major errors are made when the NIR is based on the top-down method based on the energy balance with some company-specific adjustments for specific cases (e.g. company specific emission factors) and in cases where a total picture can be obtained using bottom-up data (refineries). It was agreed that the way this check is performed should be better described.

4 Include trend analyses as QC activity at the lowest level

- Maarten Neelis indicated that in the NIR and protocols it does not always become clear whether trend analyses are done at the appropriate level. He suggested to do such analyses (i.e. asking the question: do I understand the change in this activity level or emission factor compared to last year) at the lowest aggregation level possible. This QC activity can be made explicit in the protocols (part of action point 1, see below).

5 Update and extend checking QA/QC procedures for secondary sources in the NIR

- There was consensus on the importance of checking also the QA/QC procedures used in the key secondary sources (such as the energy balance data) that are used in the NIR. It was agreed that the work done in this field a couple of years ago (with CBS, Alterra and AfvalOverlegOrgaan, will be briefly summarized.

6 Check data on uncertainties in Olivier et al. with GPG guidance

- There was consensus that this should be one of the steps in the more detailed approach that will be worked out to include a section on uncertainties in the various protocols (part of action 1 summarized below).

7 Further improve the check between Reference Approach and Sectoral Approach and the description thereof

- Several of the attendants indicated that in their opinion, the check between RA and SA is more than fine in the Netherlands and that no additional effort should be put into this.
- Peter Zijlema indicated that he would once more look into the suggestion by the expert reviewer in 2009 to better describe this check.

8 Consider updating data for the N₂O emission factor for fuels

- Maarten Neelis indicated that the source used for the N₂O emission factors is rather old and that uncertainties might be reduced updating this source. As part of the detailed approach to include uncertainties in the protocols (action 1), it will be considered whether it is necessary to work on this issue.

5.5 Summary of agreed actions points

1. Before the NIR 2011 the protocols will be updated with sections "Uncertainty Estimates" and "QA/QC". Dick Both will, together with Wim van der Maas take this action forward and also communicate this outcome of the discussion to the sector experts not involved in the workshops.
2. It will be ensured that the documents in the reference list on QA/QC and uncertainties will either be made public or that it will be indicated in the list where they can be found (*SenterNovem*)
3. Dick Both will include some lines on the update project of the national fuel list in the NIR and will check which actions from this project are still open.
4. The annual check of EU ETS data with MJV data and energy balance data will be better described in the NIR (*SenterNovem*)
5. The check on the QA QC processes at CBS, Alterra and AfvalOverlegOrgaan (conducted a number of years ago) will be briefly summarized in the NIR (*SenterNovem*)
6. Peter Zijlema will consider whether the check between the RA and SA can be better described in the NIR, following the suggestions by the expert reviewer in 2009

6 Proceedings of the workshop for CRF Sector 4 (Agriculture) and CRF Sector 5 (LULUCF)

6.1 Attendees at the workshop

Inventory Team

Dick Both (SenterNovem)

Peter Zijlema (SenterNovem)

Tobias de Ligt (SenterNovem)

Dirk Wever (PBL)

Romuald te Molder (PBL)

Sietske van der Sluis (PBL)

Gert Jan van den Born (PBL)

Marjan van Schijndel (PBL)

Isabel van den Wyngaert (WUR)

Jennie van der Kolk (WUR)

Marga Hoogeveen (WUR)

Consultants

Maarten Neelis

Paul Blinde

6.2 Agenda

The following agenda was proposed for the workshop:

- 12:30 –12:45 Lunch
- 12:45 –13:00 Opening and introduction
- 13:00 –13:30 Uncertainty assessments and sector-specific QA/QC in the NIR - IPCC guidance and execution in the Netherlands for CRF 4 (Agriculture) and CRF 5 (Land Use, Land Use Change and Forestry) (presentation by Maarten Neelis)

- 13:30 – 14:00 Uncertainty Estimates and QA/QC procedures in the NIR of the Netherlands, Denmark and Germany for emissions from the agriculture sector (presentation by Paul Blinde)
- 14:00 –14:15 Coffee break
- 14:15 –16.00 Indicative proposals for improvements
- 16:00 –16:30 Conclusion and further actions

6.3 Presentations

The presentations as given by Maarten Neelis and Paul Blinde are included as Appendix E and F respectively

6.4 Discussion on indicated improvements

In the discussion, the indicated improvements in the presentation by Maarten Neelis were discussed. The overview below reflects this discussion. Agreed action points are listed in Section 6.5.

1. Documentation:
 - Publish Bannink (2009).
 - Throughout protocols, QA/QC procedures are mentioned. Make sure that all these actions are summarized in the section on QA/QC procedures.
 - Include in the NIR a table with the key QC actions, at least those from table in chapter 8 of the IPCC GPG including an indication whether the action is taken and by whom.
 - Make description of uncertainty estimates complete and reflect the actual emission estimate methodologies.
2. Continue with expert peer reviews and mention last performed review in the NIR
3. Update the information on and the checks of the QA/QC procedures performed by CBS, WUM and other data suppliers with respect to data used in the NIR. Report on the check.
4. Check uncertainties and emission factors used in NIR with GPG and IPCC guidelines. Report on the check.
5. Compare emission factors to factors used by comparable countries. Report on the comparison.

6. Compare country-specific data with IPCC default/IFA/FAO statistics. Report on the comparison.
7. Provide framework to regularly assess the application of fixed factors; report on assessments

1 Documentation

- It was indicated that the publication of Bannink (2009) is underway.
- The attendees agreed to use Olivier et al. (2009) as the primary source for uncertainty estimates. In preparation to the NIR 2010, all protocols have already been extended by a section concerning uncertainty estimates, which has been presented to the work package leader.
- Meanwhile however uncertainty estimates may have been improved. It was agreed to report deviations from Olivier et al. (2009) in the protocols.
- There was consensus that with each change in a methodology to estimate emissions, the related uncertainty estimate should be re-assessed.
- The attendees agreed to use the IPCC default uncertainty estimate if it is not possible to track the source of an uncertainty estimate, in particular if that estimate is an expert judgement.
- The issues were raised that the person responsible for the emission estimates, the work package leader, should also be responsible for the uncertainty estimate and that the estimation of uncertainties should run parallel to the estimation of emissions.
- It was proposed to explore the option of adopting a web-based application to document QA/QC procedures and emission estimates. Such an application could automatically indicate needed actions and show the situation at any point back in time.
- A table could be included in the NIR indicating when which part of the organization performed which QC procedures. It was agreed that the inclusion of such a table should be considered. The point was raised that the table should list procedures at an aggregated level. For internal purposes, the use of a more detailed table could nevertheless be considered.
- It was suggested to indicate emission sources in the nitrogen flow diagram (Table 6.7 of the NIR 2009) in the section on agricultural soils.
- In respect of the sector LULUCF, it was suggested to consider including in the NIR a matrix with the emissions related to land use changes.
- Because of ongoing developments in the sector LULUCF, it was proposed to discuss in the NIR new scientific publications on reporting emissions from this source category.

2. Conduct expert peer reviews and mention last performed review in the NIR

- The remark was made that expert reviews are regularly conducted.

- The proposal to report the most recent expert review in the NIR was received well.

3. Update the check of the QA/QC procedures performed by CBS, WUM and other secondary data suppliers with respect to data used in the NIR. Report on the check.

- It was remarked that the uncertainty estimate of population statistics from CBS is known and is also used in the NIR.
- The attendees concluded that updating the checks of QA/QC procedures of secondary data suppliers is relevant for all CRF sectors and should be taken up at a higher level. This will be further planned between the involved QAQC coordinators of SenterNovem and ER.

4. Check uncertainty estimates and emission factors used in NIR with GPG and IPCC guidelines. Report on the check.

- This exercise has partly already been conducted, but could be communicated in a more consistent and transparent way in the NIR. It was mentioned that, because of the methodology used for the emission estimate, it can sometimes be difficult to compare country-specific emission factor data to IPCC defaults. It was suggested to improve transparency in such cases by reporting why making a comparison would be difficult or not feasible. The way of reporting emission factor differences as is included for agricultural soils (Table 4D) is probably the best format that could be followed also for other source categories. Comparisons of the uncertainty estimates can be summarized in the protocols.

5. Compare emission factors to factors used by comparable countries. Report on the comparison

- It was acknowledged that comparing used emission factors and methodologies to estimate emissions and uncertainties with those of other countries has an added value.
- The suggestion was made that such a comparison could be done within the framework of a meeting with experts from other countries.
- The Netherlands have performed a brief bilateral review with Belgium some years ago.
- It was indicated that in view of time and budget constraints in the various countries, an inter-country-comparison may not have priority for the NIR 2010.

6. Compare country-specific data with IPCC default/IFA/FAO statistics. Report on the comparison.

- The importance of such a comparison was acknowledged and stressed.
- There was some discussion on reason for the difference in statistics between FAO data and national data sources (e.g. on animal population, forest fires, wood

statistics). The reasons did not become clear and it was agreed to investigate this issue. The question was posed who would be responsible for the comparison: the work package leaders or the task forces. As a compromise, the possibility for a mixed approach was mentioned. The discussion will be continued between the coordinators at ER and SenterNovem.

7. Provide framework to regularly assess the application of fixed factors; report on assessments

- The time between updates of fixed values is related to the uncertainty estimates. It was stated that in principle updates of methods are considered as part of the NIR improvement programme. The update of the factors was in 2005.

6.5 Summary of agreed actions points

1. Before the NIR 2011, the protocols will be updated with sections "Uncertainty Estimates" and "QA/QC" (see also Chapter 5.5). Dick Both will, together with Wim van der Maas, take this action forward. It was agreed (also taken into account the discussions during the first workshop, Chapter 5) that in these updated protocols, the following methodology should be used:
 - Olivier et al. (2009) should be the primary source for uncertainty estimates. Deviations from this report should be reported in the protocols.
 - The uncertainty estimate should always reflect the most recent emission estimate methodology. The work package leaders are responsible that this is the case.
 - In case the uncertainty estimate is only based on expert judgement that can not be traced back to individual experts, the IPCC default uncertainty estimates will be used.
 - A comparison with the default uncertainty estimates as recommended by the IPCC should be made
2. Marjan van Schijndel will add to the nitrogen flow diagram in the NIR, also the relevant emission data from the various source categories.
3. Peter Zijlema will include in the NIR an overview of the most recent expert review that has been conducted for each sector.
4. The work package leader responsible for the various emission source categories in these sectors will improve the comparison of emission factors between the Dutch NIR and the IPCC defaults from the IPCC guidelines. The format as used for emissions from agricultural soils (4D), Table 6.7 in the NIR 2009 can be used as example. If the comparison is not possible, it should clearly be indicated why this is not possible.
5. The reasons for the difference in statistics between FAO data and national data sources will be further investigated (to be planned between SenterNovem and the ER coordinator).

7 Proceedings of meeting on CRF Sector 6 (Waste)

7.1 Attendees

Inventory Team

Guus van den Berghe (NL Agency)

Olaf van Hunnik (NL Agency)

Bas van Huet (NL Agency)

Marco Kraakman (NL Agency)

Adrie Veeken (NL Agency)

Consultants

Maarten Neelis

Paul Blinde

7.2 Summary of conclusions and actions points

After the conclusions of the two workshops (Chapter 5 and 6) were communicated, the following was concluded:

- The attendees are positive about the approach described in Section 6.5 (1) and are in anticipation of further information on plans to update the protocols with respect to "Uncertainty Estimates" and "QA/QC"
- The attendees will have a look at how uncertainty estimates based on expert judgements compare with the default uncertainty estimates as recommended by the IPCC.
- The attendees will check whether the documents that they refer to in the NIR and protocols are available.
- Olaf van Hunnik will check whether the section in the NIR on waste incineration refers to the correct protocol. The NIR 2010 will contain the correct reference.
- The attendees are positive about the plans to look at QA/QC processes at secondary data suppliers (e.g. CBS) and are in anticipation of further information.
- The attendees note that a large number of quality checks are regularly performed, that reporting of QA/QC procedures is important, but that reporting all checks would lead to an undesirably long list. A balance needs to be found between adequate reporting and transparency.

7.3 Other topics discussed

The topics below were addressed, but no action was agreed upon during the meeting, either because no appropriate action could readily be identified or because other issues were deemed to be more pressing:

- The attendees discussed the reporting of descriptions of methodologies. Methodologies should in principle be described in protocols and the resulting emissions and deviations from the protocols should be described in the NIR. This approach is supported by the attendees.
- The composition of waste is in some cases assumed to be constant while in reality it varies in time. This is because the composition is not always known. Improvement the situation is not foreseen since continuously monitoring waste content for the purpose of emission reporting would lead to a disproportionate effort given the emissions from the sector.
- The estimates of the share of waste of biogenic origin per waste category is not regularly updated and this could result in under or overestimation of emissions from waste. No way to improve the situation could however readily be identified.
- Comparison of country-specific emissions factors with IPCC default factors is not reported for all sub-sectors
- .

8 Proceedings of meeting on CRF Sector 1A3 (Transport)

8.1 Attendees

Inventory Team

John Klein (CBS)

Gerben Geilenkirchen (PBL)

Otto Swertz (CBS)

Consultants

Maarten Neelis

Paul Blinde

8.2 Summary of conclusions

After the conclusions of workshops were communicated, the following was concluded:

- All attendees welcome the initiative to hear that uncertainty estimates given renewed consideration. The attendees are presently not satisfied with the uncertainties reported for the sector 'Transport' and were already planning to address that topic. They look forward to receiving further information on this.
- The attendees would to update uncertainty estimates on the fuel sales to road transport and on the emission factors of those fuels as soon as possible. They regard CBS to be appropriate organization to give update estimates. Already in the discussion during the meeting, Otto Swertz identified some ways to improve those uncertainty estimates. The attendees therefore welcome the plans to consider secondary data suppliers such as the CBS and look forward to receiving further information on those plans.
- The attendees are positive about the approach described in Section 6.5 (1) and are in anticipation of further information on plans to follow that approach.
- All attendees agree that is important to check whether the documents that they refer to in the NIR and protocols are available.
- All attendees agreed that they should check whether the NIR provides references for all uncertainty estimates.

8.3 Other topics discussed

The topics below were addressed, but no action was agreed upon, either because no appropriate action could readily be identified or because other issues were deemed to be more pressing:

- The uncertainty for CO₂ emissions from road transport is presently set by the differences between emissions calculated by two different methods. One of those methods is however less accurate than the other and the uncertainty estimate should therefore be reconsidered. Using two different methods could however serve a purpose in view of QA/QC.
- Emission factors for CO₂ emissions from road transport are based on the most accurate data presently available to the inventory team. However, it was acknowledged that especially the estimates of the emission factors for the various fuels is based on a rather old source (2004) when considering the importance of the source in the overall emissions and the known developments in fuel composition in recent years that has very likely an effect on the emission factors. This point is also acknowledged in the study on the national fuel list conducted in 2007 (Section 5.4 (2)).
- No comparison of country-specific emissions factors with IPCC default factors is reported in the NIR.
-

9 Assessment of NIR and background document on uncertainties for CRF sector 3 (Solvent and other product use)

For CRF sector 3 'Solvent and other product use' we assessed the relevance of the conclusions of the workshop based on the background document on uncertainties (Olivier et al. 2009) and the sector on uncertainties in the NIR 2009.

We conclude that:

- Uncertainties in this sector are based on expert judgements. Following the conclusions of the workshops, the IPCC default uncertainty estimates should be used, in case these judgements that can not be traced back to individual experts.
- The NIR 2009 reports an uncertainty in CO₂ emissions is of approximately 27%, while Olivier et al. (2009) reports approximately 25%.
- Overall, the NIR does not give sources for uncertainty estimates
- .

References

- [1] IPCC, 2001, IPCC good practice guidance and uncertainty management in national greenhouse gas inventories
- [2] IPCC, 2003, IPCC LULUCF good practice guidance and uncertainty management in national greenhouse gas inventories
- [3] NIR, 2009, Greenhouse Gas Emissions in the Netherlands 1990 - 2007, National Inventory Report 2009
- [4] Olsthoorn, X. and Pielaat, A., 2002, Tier-2 uncertainty analysis of the Dutch greenhouse gas emissions 1999, Institute for Environmental Studies, the Netherlands
- [5] Olivier, JGJ, Brandes, LJ and te Molder, RAB, 2009, Uncertainty in the Netherlands' greenhouse gas emissions inventory. Documentation and estimation of annual and trend uncertainty using the IPCC Tier 1 approach, MNP, Bilthoven
- [6] Ramírez, A.R., De Keizer, C., and Van der Sluijs J.P., 2006, Monte Carlo Analysis of Uncertainties in the Netherlands Greenhouse Gas Emission Inventory for 1990-2004, Copernicus Institute for Sustainable Development and Innovation, the Netherlands, ISBN-13 978-90-8672-011-8
- [7] UNFCCC, 2007, Report of the individual review of the greenhouse gas inventory of the Netherlands submitted in 2006

Appendix A **Template for input to workshops (uncertainties)**

Input to workshop (uncertainty estimates)
A.1: List those uncertainty estimates in Table A7-2 and A7-3 for which it is not clear from the documentation (Olivier et al., 2007) what the source for the uncertainty estimate is or whether the description can be made more precise.
...
A.2: List the source of the uncertainty estimate (additional to Olivier et al., 2009), if known by you.
...
A.3: Indicate uncertainty estimates that, in your opinion, are no longer up-to-date, for example if the uncertainty estimate description refers to a methodology for estimating the emissions that is no longer used.
...
A.4 List those uncertainty estimates that you think can be improved, for instance if the method for estimating the uncertainty (e.g. expert judgement) is not in line with the methods to determine the emissions (e.g. measurements).
...
A.5 List those source categories for which, in your opinion, the uncertainty can be reduced by changing the methodology for estimating emissions from this source category.
...

Appendix B

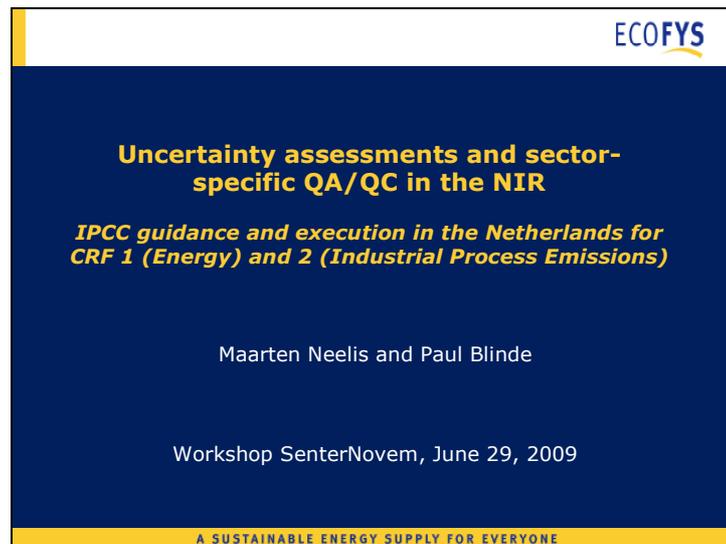
Template for input to workshops (sector-specific QA/QC procedures)

Input to workshop (QA/QC procedure)
B.1 List the sector-specific QA/QC activities that for which the description is not up-to-date or for which the description can otherwise be improved.
...
B.2 List the sector-specific QA/QC activities that are undertaken, but that are not described in the two sources given.
...
B.3 List additional sector-specific QA/QC procedures that you think could be useful for the considered sources.
...

Appendix C

Uncertainty assessments and sector-specific QA/QC in the NIR - IPCC guidance and execution in the Netherlands for CRF 1 (Energy) and 2 (Industrial Process Emissions) (presentation by Maarten Neelis on workshop of 29 June)

Slide 1



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Uncertainty assessments and sector-specific QA/QC in the NIR

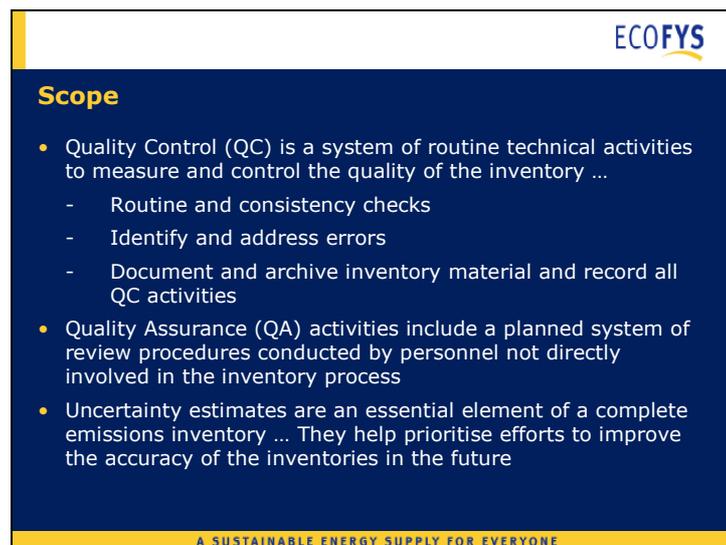
IPCC guidance and execution in the Netherlands for CRF 1 (Energy) and 2 (Industrial Process Emissions)

Maarten Neelis and Paul Blinde

Workshop SenterNovem, June 29, 2009

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Slide 2



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Scope

- Quality Control (QC) is a system of routine technical activities to measure and control the quality of the inventory ...
 - Routine and consistency checks
 - Identify and address errors
 - Document and archive inventory material and record all QC activities
- Quality Assurance (QA) activities include a planned system of review procedures conducted by personnel not directly involved in the inventory process
- Uncertainty estimates are an essential element of a complete emissions inventory ... They help prioritise efforts to improve the accuracy of the inventories in the future

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Slide 3



Scope

- Focus of today on the sector-specific procedures for CRF 1 (Energy) and 2 (Industrial Process Emissions)
- Aim is to make good things better, not to summarize how bad things are (because in general they are not!)
- Aim is not to have a complete overview of everything, but to start a discussion on some key issues
- Issues at following sheets are meant as discussion points. Not all actions may be known to the consultants. Therefore, the issues may or may not be correct or relevant. Experts are requested to express their opinions and to provide additional information

In italics: Good Practice Guidance
In normal font: possible improvements

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Slide 4



Source-specific QA/QC procedures (relevant for both)
Discussion at workshop: are these issues correct ? relevant ?

- *Document uncertainty estimates and QA/QC*
 - The documentation can certainly be improved (1)
- *Emission factors: use IPCC as default, but use country specific factors if available and better*
 - Energy: National fuel list, but ... (2)
 - Further use of e.g. EU ETS data could be considered (3)
- *Compare emissions with previous years*
 - Part of the general QA/QC, but maybe not at the lowest level (4)
- *Activity data: Regular check on QC procedures and uncertainties in secondary sources*
 - Extend regular check on QA/QC and uncertainties to energy statistics (5)
- *Use the GPG as source for uncertainty estimates*
 - Check of "Olivier et al." with GPG possible (6)

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Slide 5



Energy – CO₂ emissions for stationary combustion
 Discussion at workshop: are these issues correct ? relevant ?

- *Estimate uncertainties in fuel consumption in consultation with the sample survey designers*
- *In cooperation with agency in charge of energy statistics: check time series of statistical differences in energy balances for systematic effects*
- *Cross-check caloric values with IEA values*
 - Detailed discussion with CBS could be useful (2 / 5)
- *Compare estimates of CO₂ emissions from fuel combustion using Sectoral Tier 1 and Tier 2 Approach with the Reference approach*
 - Reporting of this check can be further improved (7)

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Slide 6

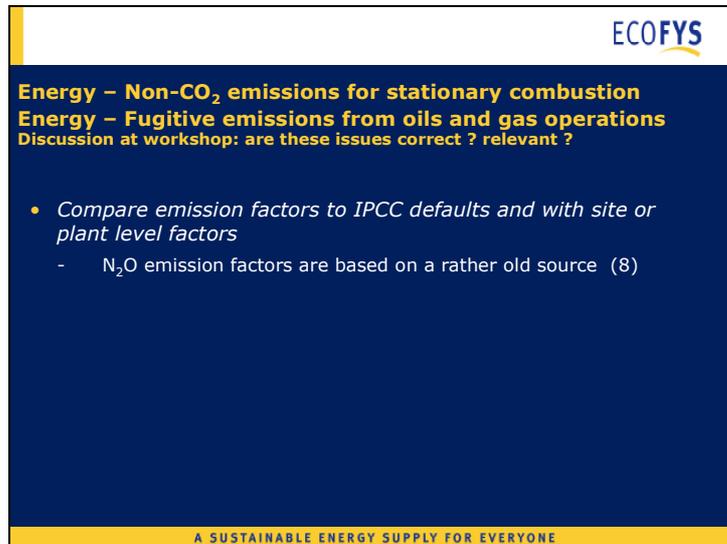


Energy – CO₂ emissions for stationary combustion
 Discussion at workshop: are these issues correct ? relevant ?

- *Use emission data from large plants to cross-check national energy statistics*
- *Use monitoring systems at large plants to check emissions and oxidation factors*
- *Evaluate quality control of fuel measurements*
 - Extend present data consistency project (e.g. how to make best use of the detailed EU ETS monitoring data; how to further improve the check between ETS and NIR etc.) (3)

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Slide 7

The slide features a dark blue background with a yellow header bar on the left and a yellow footer bar at the bottom. The ECOFYS logo is positioned in the top right corner. The main text is in yellow and white, discussing non-CO2 emissions and fugitive emissions from oils and gas operations. A list of bullet points is provided, and the footer contains the mission statement.

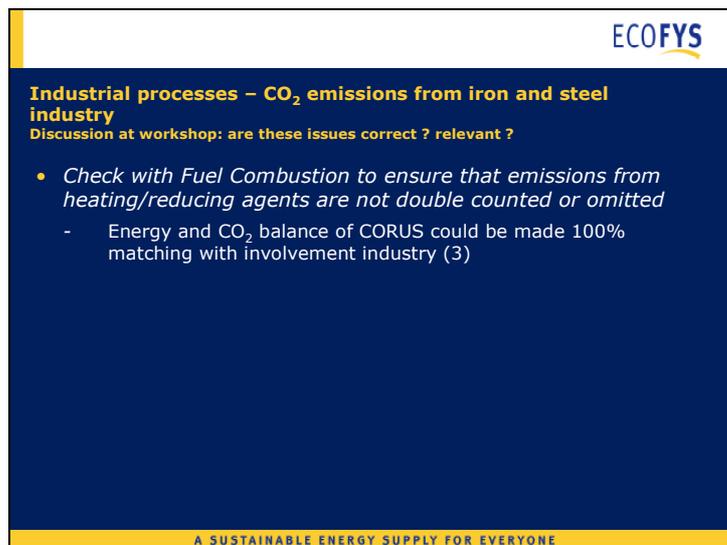
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Energy – Non-CO₂ emissions for stationary combustion
Energy – Fugitive emissions from oils and gas operations
Discussion at workshop: are these issues correct ? relevant ?

- *Compare emission factors to IPCC defaults and with site or plant level factors*
 - N₂O emission factors are based on a rather old source (8)

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Slide 8

The slide features a dark blue background with a yellow header bar on the left and a yellow footer bar at the bottom. The ECOFYS logo is positioned in the top right corner. The main text is in yellow and white, discussing CO2 emissions from iron and steel industry. A list of bullet points is provided, and the footer contains the mission statement.

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Industrial processes – CO₂ emissions from iron and steel industry
Discussion at workshop: are these issues correct ? relevant ?

- *Check with Fuel Combustion to ensure that emissions from heating/reducing agents are not double counted or omitted*
 - Energy and CO₂ balance of CORUS could be made 100% matching with involvement industry (3)

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Slide 9



Industrial processes – N₂O emissions from adipic acid and nitric acid production

Industrial processes – PFC emissions from aluminium production

Industrial processes – Estimation of HFC-23 emissions from HCFC 22 manufacture

Industrial processes – SF₆ Emissions from electrical equipment and other sources

Discussion at workshop: are these issues correct ? relevant ?

- Optimal use of plant specific data could serve as example for other plant specific information (3)

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Slide 10



Industrial processes –Emissions from substitutes for ozone depleting substances (ODS substitutes)

Discussion at workshop: are these issues correct ? relevant ?

- *Make use of industry expertise*
- *Evaluate QA/QC procedures associated with estimating equipment and product inventories (5)*
- *Compare emission factors used for Tier 2 (which should be based on country specific studies) with default values*

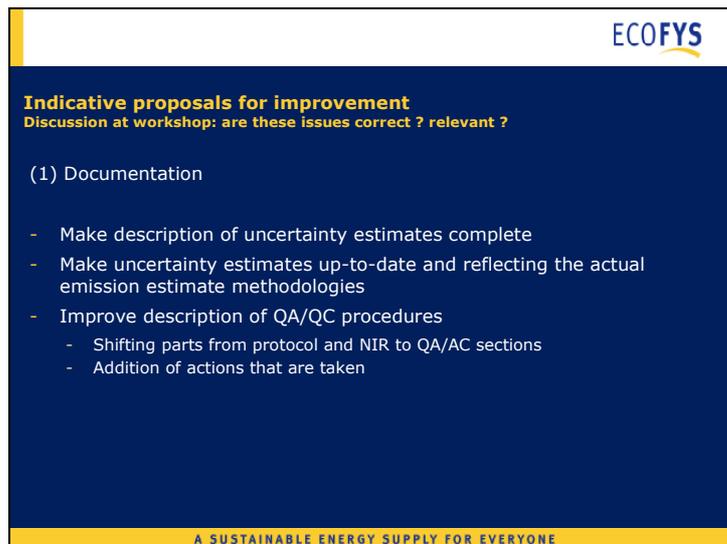
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Slide 11



Slide 11 is a dark blue presentation slide with a yellow header bar on the left and a yellow footer bar at the bottom. The ECOFYS logo is in the top right corner. The main text is centered and reads: "Thank you" in yellow, "Maarten Neelis and Paul Blinde" in white, and "Workshop SenterNovem, June 29, 2009" in white. The footer bar contains the text "A SUSTAINABLE ENERGY SUPPLY FOR EVERYONE" in white.

Slide 12



Slide 12 is a dark blue presentation slide with a yellow header bar on the left and a yellow footer bar at the bottom. The ECOFYS logo is in the top right corner. The main text is centered and reads: "Indicative proposals for improvement" in yellow, "Discussion at workshop: are these issues correct ? relevant ?" in white, "(1) Documentation" in white, and a bulleted list in white. The footer bar contains the text "A SUSTAINABLE ENERGY SUPPLY FOR EVERYONE" in white.

Indicative proposals for improvement
Discussion at workshop: are these issues correct ? relevant ?

(1) Documentation

- Make description of uncertainty estimates complete
- Make uncertainty estimates up-to-date and reflecting the actual emission estimate methodologies
- Improve description of QA/QC procedures
 - Shifting parts from protocol and NIR to QA/AC sections
 - Addition of actions that are taken

Slide 13



Indicative proposals for improvement
Discussion at workshop: are these issues correct ? relevant ?

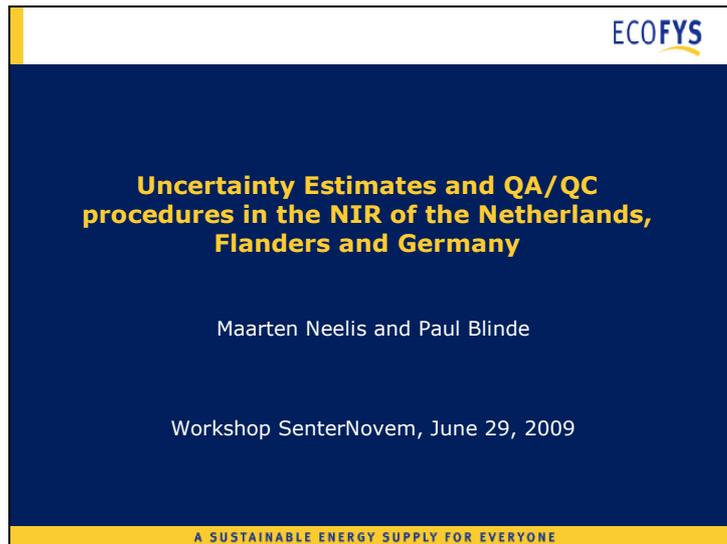
- (2) Follow-up of improvement project national fuel list
- (3) Consider further use of bottom-up data (from e.g. EU ETS)
- (4) Trend analyses as QC activity at the lowest level
- (5) Update and extend QA/QC procedures for secondary sources (NB energy statistics)
- (6) Check Olivier et al. with GPG
- (7) Further improvement of check between RA and SA and description thereof
- (8) Consider updating data for N₂O emission factors

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Appendix D

Uncertainty estimates and QA/QC procedures in the NIR of the Netherlands, Flanders and Germany (presentation by Paul Blinde on workshop of 29 June)

Slide 1



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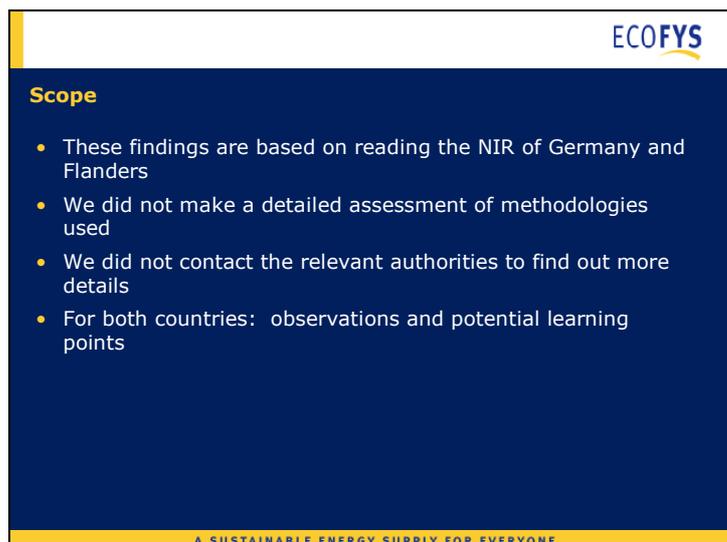
Uncertainty Estimates and QA/QC procedures in the NIR of the Netherlands, Flanders and Germany

Maarten Neelis and Paul Blinde

Workshop SenterNovem, June 29, 2009

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Slide 2



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Scope

- These findings are based on reading the NIR of Germany and Flanders
- We did not make a detailed assessment of methodologies used
- We did not contact the relevant authorities to find out more details
- For both countries: observations and potential learning points

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Slide 3



Transparency is an issue in all countries

- The Netherlands, Flanders and Germany all have documents for QA/QC procedures and uncertainties
 - The Netherlands: QA/QC programme (SenterNovem, 2008) and annual activity program of the PRTR (PBL, 2008)
 - Flanders: All procedures (ISO 9001:2000) on CDROM of Annex 4
 - Germany: Handbook for QA/QC in preparation of emissions inventories and reporting under the UNFCC and EU Decision 280/2004/EC and research project on uncertainties (UBA, 2004)

BUT ...

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Slide 4



Transparency is an issue in all countries

- Finding these documents using the NIR is not straightforward
 - The Netherlands: where to find the QA/QC program (SenterNovem, 2008) and annual activity program (PBL, 2008) ?
 - Flanders: How to obtain CDROM of Annex 4 ?
 - Germany: UBA (2004) on uncertainties is unpublished Handbook on QA/QC (only on intranet)

So all countries seem to have their Olivier et al. (in print) documents

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Slide 5

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NIR Belgium

Reporting in the NIR:

- No explicit description of sector specific QA/QC procedures
- Methodology of uncertainty calculation is described sector specific

Learning points

- Peer review with help of other country (the Netherlands in 2005)
- Summarizing QC Table:

QC Activity	Task and procedures	Responsible	Deadline
1. Check that assumptions and criteria...	•Cross-check descriptions... •Check that...is properly recorded	Working group on Emissions of the coordination committee...	August 31
...

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Slide 6

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NIR Germany

Reporting

- Very detailed (e.g. SF₆ from sport shoes): 200 pages for CRF 1 and 2 (40 pages in Dutch NIR); Other choice on documentation in NIR versus other documents

Lessons

- Due to high level of detail it is very straightforward to find sector specific information
- Emission factors are compared to factors from
 - Default emission factor
 - Other countries
- Use is made of EU ETS monitoring data, but how is unclear
- Also makes use of summarizing tables (similar to NIR Belgium)

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Slide 7

Comparison of uncertainties (highlights)

IPCC source category		Gas	NL		BG		DE	
			AD	EF	AD	EF	AD	EF
1A1a	Stationary Combustion: Public Electricity and Heat Production: liquids	CO ₂	1	10	1	2	3.2	1.5
1A1b	Stationary Combustion: Petroleum refining: liquids	CO ₂	10	10	5	2	3.1	0.5
1A4a	Stationary Combustion: Other Sectors, Commercial/institutional, gases	CO ₂	20	1	4	1	8	2.7
1A4c	Stationary Combustion: Other Sectors, Agriculture/Forestry/Fisheries, liquids	CO ₂	20	2	15	5	2.2	2.2
2A1	Cement production	CO ₂	5	10	5	5	2	5

Note: comparison was not always possible due to differences in levels of aggregation

A detailed comparison can be worthwhile, some differences are unexpected!

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Slide 8

-
- Conclusions**
- Transparency of QA / QC procedures is an issue in other countries as well
 - Lessons can be learned from comparing the NIR of countries (ways of describing, uncertainty comparisons etc.)
 - Other documents are needed to perform a more in-depth comparison of QA/QC plans and methodology for estimating uncertainty, probably best organized via bilateral meetings between countries. Key topics could be:
 - Energy balance data in relation to uncertainty and QA / QC
 - Use of EU ETS data
 - How to report QA / QC and uncertainties
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Slide 9



Thank you

Maarten Neelis and Paul Blinde

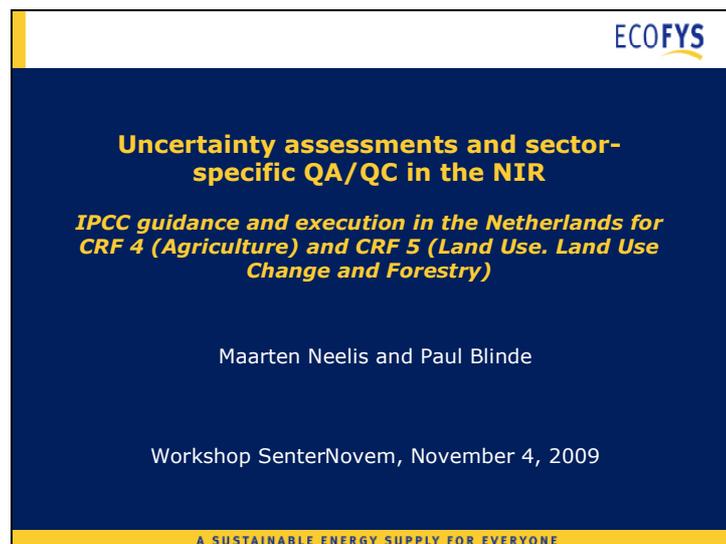
Workshop SenterNovem, June 29, 2009

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Appendix E

Uncertainty assessments and sector-specific QA/QC in the NIR - IPCC guidance and execution in the Netherlands for CRF 4 (Agriculture) and CRF 5 (Land Use, Land Use Change and Forestry) (presentation by Maarten Neelis on workshop of 4 November)

Slide 1



ECOFYS

Uncertainty assessments and sector-specific QA/QC in the NIR

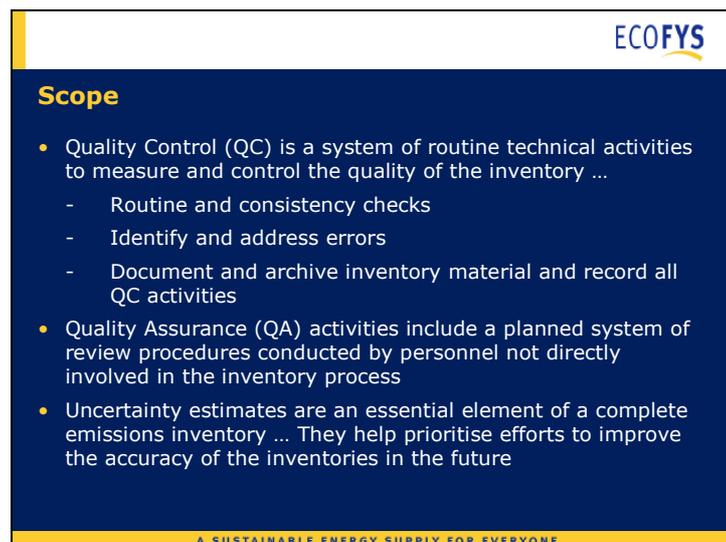
IPCC guidance and execution in the Netherlands for CRF 4 (Agriculture) and CRF 5 (Land Use, Land Use Change and Forestry)

Maarten Neelis and Paul Blinde

Workshop SenterNovem, November 4, 2009

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Slide 2



ECOFYS

Scope

- Quality Control (QC) is a system of routine technical activities to measure and control the quality of the inventory ...
 - Routine and consistency checks
 - Identify and address errors
 - Document and archive inventory material and record all QC activities
- Quality Assurance (QA) activities include a planned system of review procedures conducted by personnel not directly involved in the inventory process
- Uncertainty estimates are an essential element of a complete emissions inventory ... They help prioritise efforts to improve the accuracy of the inventories in the future

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Slide 3



Scope

- Focus of today on the sector-specific procedures
- Aim is to make good things better, not to summarize how bad things are (because in general they are not!)
- Aim is not to have a complete overview of everything, but to start a discussion on some key issues
- Aim is not on discussing the emission estimation methodologies, but on the QA/QC procedures and uncertainty estimates
- Issues at following sheets are meant as discussion points. Not all actions may be known to the consultants. Therefore, the issues may or may not be correct or relevant. Experts are requested to express their opinions and to provide additional information

In italics: Good Practice Guidance
In normal font: possible improvements

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Relevant Conclusions of workshop for Energy sector and Industrial Processes

1. The protocols should be year-robust and data regarding specific years only should be put in the NIR. The NIR can also report changes in the protocols and deviations from the protocol.
2. To each protocol a section "QA/QC" should be added containing partly information that is currently also already in the protocol.
3. The documents in the reference list on QA/QC and uncertainties will either be made public or that it will be indicated in the list where they can be found
4. It will be considered to include in the NIR a table with the key QA/QC actions per source category including an indication whether the action is taken and by whom
5. There was consensus on the importance of checking the QA/QC procedures used in the key secondary sources (CBS) that are used in the NIR.

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Source-specific QA/QC procedures (relevant for all)
Discussion at workshop: are these issues correct ? relevant ?

- *Document uncertainty estimates and QA/QC*
 - The documentation can be improved (1)
- *Conduct expert peer reviews*
 - Are these conducted? If so, it may be good to document them more prominently (2)
- *Activity data:*
 - Extend regular check (and report) on QC procedures and uncertainties in secondary sources (CBS, WUM) (3)
- *Use the GPG as source for uncertainty estimates*
 - Check of Olivier et al. (2009) with GPG where possible (4)

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Livestock characterization data
Discussion at workshop: are these issues correct ? relevant ?

Uncertainties

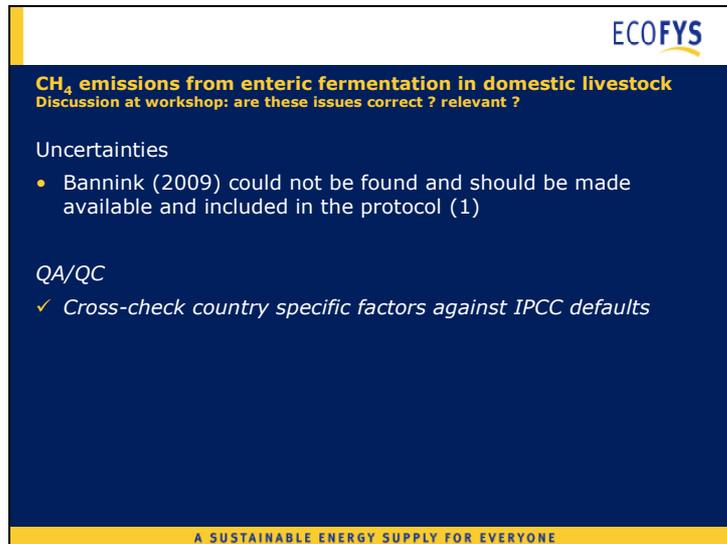
- The uncertainty in the population data could be examined in cooperation with CBS (1)

QA/QC

- *Check for consistency in livestock characterisation data across source categories*
- *Review QA/QC associated with secondary data sources*
 - Check of QA/QC in annual agricultural survey performed by CBS (3)
- *Review livestock characterisation data by e.g.:*
 - *Compute change in population over time from birth/death rates, slaughter rates, etc. and compare to statistics on total population*
 - *Compare total production (e.g. meat, milk, and wool) for animal categories with statistics on total production*
 - *Cross-check activity data against other available reference sources, e.g. FAO statistics*
 - *Check feed intake estimates for reasonableness*

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CH₄ emissions from enteric fermentation in domestic livestock
Discussion at workshop: are these issues correct ? relevant ?

Uncertainties

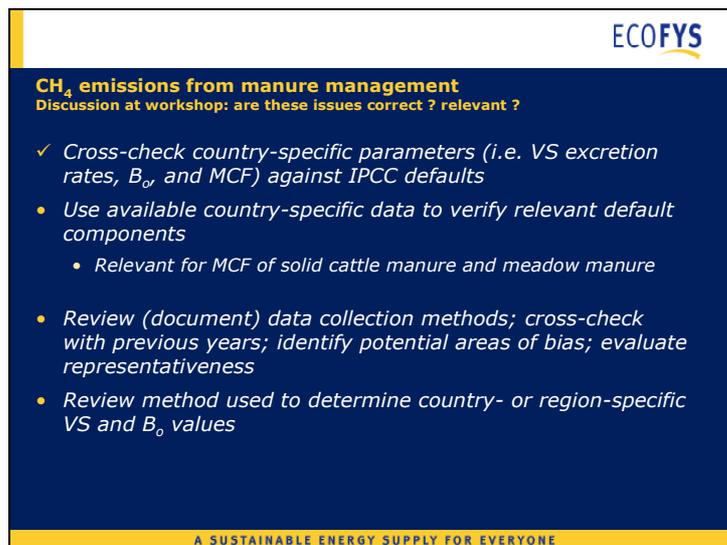
- Bannink (2009) could not be found and should be made available and included in the protocol (1)

QA/QC

- ✓ *Cross-check country specific factors against IPCC defaults*

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CH₄ emissions from manure management
Discussion at workshop: are these issues correct ? relevant ?

- ✓ *Cross-check country-specific parameters (i.e. VS excretion rates, B₀ and MCF) against IPCC defaults*
- *Use available country-specific data to verify relevant default components*
 - *Relevant for MCF of solid cattle manure and meadow manure*
- *Review (document) data collection methods; cross-check with previous years; identify potential areas of bias; evaluate representativeness*
- *Review method used to determine country- or region-specific VS and B₀ values*

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N₂O emissions from manure management
Discussion at workshop: are these issues correct ? relevant ?

- ✓ *If using country-specific data for N excretion per animal and fraction of excretion that is managed in manure management systems, compare these values to the IPCC default values*
 - Check reporting in the NIR (6)

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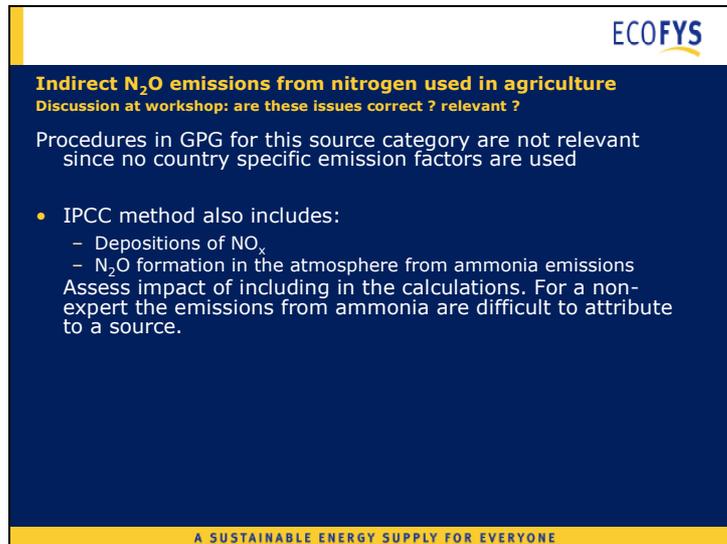


Direct N₂O emissions from agricultural soils
Discussion at workshop: are these issues correct ? relevant ?

- *Compare emission factors to default factors and to factors used by comparable countries. Explain and document differences*
 - Compare to factors used by comparable countries (5)
- *If using factors based on direct measurements: review measurements, on site QA/QC protocol, and compare estimates between sites and with default-based estimates*
 - Calculations make use of fixed factors; review these factors based on e.g. direct measurements
- *Compare country-specific data on synthetic fertilizer consumption and crop production with data from the IFA and the FAO*
 - This could be added to the NIR (6)
- *Ensure that N excretion data are consistent with those used for manure management systems source category*
- *Country-specific values should be compared to IPCC defaults*
 - Relevant for N-input to soil (already done) and NH₃ volatilisation (6)

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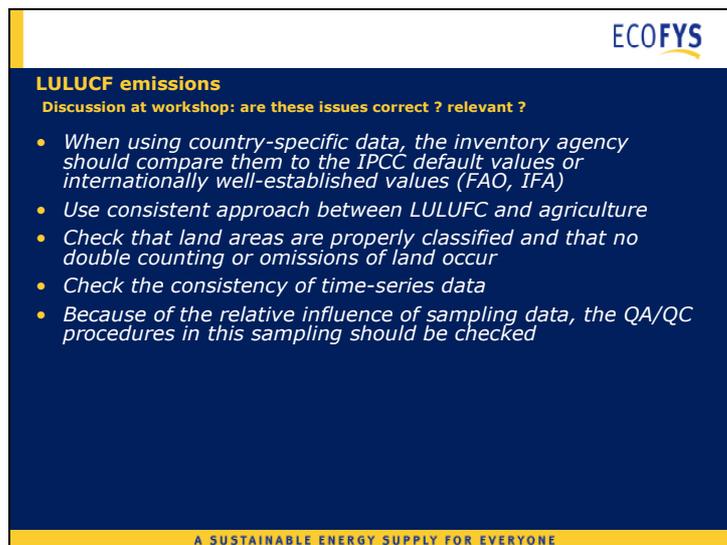
Indirect N₂O emissions from nitrogen used in agriculture
Discussion at workshop: are these issues correct ? relevant ?

Procedures in GPG for this source category are not relevant since no country specific emission factors are used

- IPCC method also includes:
 - Depositions of NO_x
 - N₂O formation in the atmosphere from ammonia emissionsAssess impact of including in the calculations. For a non-expert the emissions from ammonia are difficult to attribute to a source.

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LULUCF emissions
Discussion at workshop: are these issues correct ? relevant ?

- *When using country-specific data, the inventory agency should compare them to the IPCC default values or internationally well-established values (FAO, IFA)*
- *Use consistent approach between LULUCF and agriculture*
- *Check that land areas are properly classified and that no double counting or omissions of land occur*
- *Check the consistency of time-series data*
- *Because of the relative influence of sampling data, the QA/QC procedures in this sampling should be checked*

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Indicative proposals for improvement
 Discussion at workshop: are these issues correct ? relevant ?

1. Documentation:
 - Publish Bannink (2009)
 - Add to each protocol a section on uncertainties and QA/QC containing partly information that is currently also already in the protocol.
 - Include in the NIR a table with the key QA/QC actions per source category including an indication whether the action is taken and by whom
 - Make description of uncertainty estimates complete and reflecting the actual emission estimate methodologies

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Indicative proposals for improvement
 Discussion at workshop: are these issues correct ? relevant ?

2. Conduct expert peer reviews or better describe them
3. Check the QA/QC procedures performed by CBS, WUM and other data suppliers with respect to data used in the NIR; report on check
4. Check uncertainties and emission factors used in NIR with GPG and IPCC guidelines; report on check
5. Compare emission factors to factors used by comparable countries; report on comparison
6. Compare country-specific data with IPCC default/IFA/FAO statistics; report on comparison
7. Provide framework to regularly assess the application of fixed factors; report on assessments

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Thank you

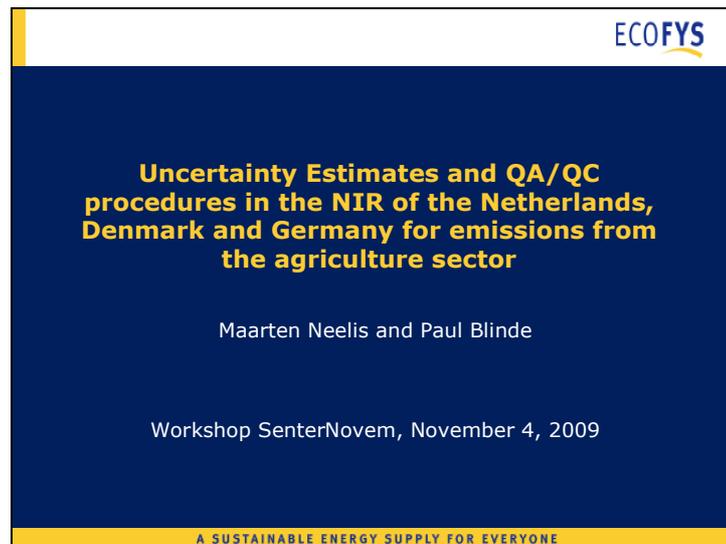
Maarten Neelis and Paul Blinde

Workshop SenterNovem, November 4, 2009

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Appendix F Uncertainty Estimates and QA/QC procedures in the NIR of the Netherlands, Denmark and Germany for CRF 4 (Agriculture) and CRF 5 (Land Use, Land Use Change and Forestry) (presentation by Paul Blinde on workshop of 4 November)

Slide 1



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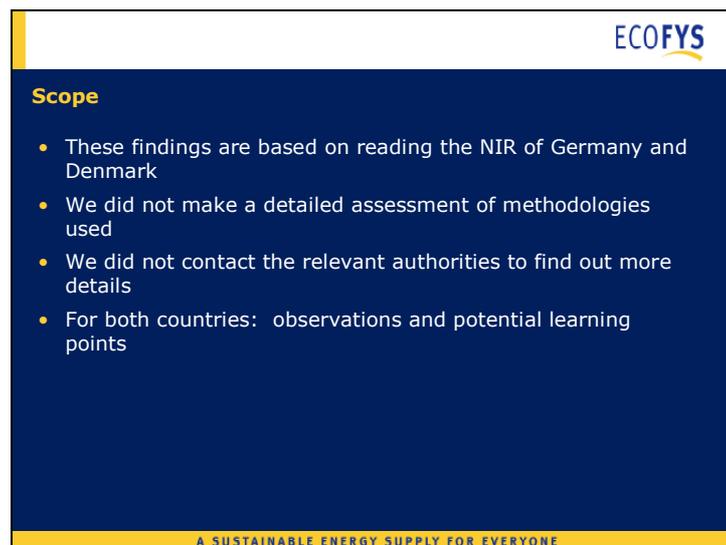
Uncertainty Estimates and QA/QC procedures in the NIR of the Netherlands, Denmark and Germany for emissions from the agriculture sector

Maarten Neelis and Paul Blinde

Workshop SenterNovem, November 4, 2009

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Slide 2



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Scope

- These findings are based on reading the NIR of Germany and Denmark
- We did not make a detailed assessment of methodologies used
- We did not contact the relevant authorities to find out more details
- For both countries: observations and potential learning points

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Slide 3

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General section on uncertainty estimates and QA/QC: Germany

- Tier 2 uncertainties determination every three years
- Background document: Handbook for QA/QC in preparation of emissions inventories and reporting under the UNFCCC and EU Decision 280/2004/EC and research project on uncertainties (UBA, 2004)
- Finding these documents using the NIR is not straightforward: UBA (2004) on uncertainties is unpublished, Handbook on QA/QC only on intranet

Learning points:

- Make sure all background documents are available: QA/QC programme (SenterNovem, 2008) and annual activity program of the PRTR (PBL, 2008)
- Included a table in NIR or background documents:

Role	Tasks	Responsible
...
...

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General section on uncertainty estimates and QA/QC: Denmark

- Denmark has included the quality manual in the NIR

Learning points:

- Structuring QA/QC plan (see table):

Data Storage Level 1	1. Accuracy	DS.1.1.2	Quantification of uncertainty level of every single data value including the reasoning for the specific value
Data Processing Level 1	5. Correctness	DP.1.5.2	Verification of calculation results using time-series
...

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Sector specific sections: Denmark

Reporting in the NIR:

- Dedicated section on uncertainty for Agriculture
- Only Tier 1 uncertainty calculation
- Background documents for uncertainty estimates: Olesen et al. (2001), Gyldenkaerne pers. comm. (2005)
- Dedicated section on QA/QC procedures for Agriculture
- QA/QC plan under development, but is very well structured as mentioned earlier

Learning points:

- Structuring QA/QC plan (see before):

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Sector specific sections: Germany

Reporting

- Very detailed structuring, although sections on uncertainty estimates and QA/QC for 4A, 4B and 4D
- Background documents for uncertainty estimates: Joint EMEP/CORINAIR Atmospheric Emission Inventory Guidebook (2003), IPCC (2006) and DÄMMGEN (2005)
- Uncertainty estimates in general are not country-specific
- No general quality control (Tier 1) since the staff unit was being restructured

Lessons

- In general, but not for uncertainty estimates and QA/QC, high level of detail makes is very straightforward to find sector specific information
- Emission factors are compared to factors from other countries
- Agricultural section was reviewed by Finnish experts in the context of a bilateral assessment process

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Comparison of uncertainties

IPCC source category		Gas	NL		DEN		DEU	
			AD (%)	EF (%)	AD (%)	EF (%)	AD (%)	EF (%)
4A1	CH4 emissions from enteric fermentation in domestic livestock: cattle	CH ₄	5	15	10	8	0	6.1-10
4A8	CH4 emissions from enteric fermentation in domestic livestock: swine	CH ₄	5	50	10	8	0	
4A	CH4 emissions from enteric fermentation in domestic livestock: other	CH ₄	5	30	10	8	0	
4B	Emissions from manure management	N ₂ O	10	100	10	100	0	15.2-42.9
4B1	Emissions from manure management: cattle	CH ₄	10	100	10	100	0	12.9-20
4B8	Emissions from manure management: swine	CH ₄	10	100	10	100	0	16.6
4B9	Emissions from manure management: poultry	CH ₄	10	100	10	100	0	
4B	Emissions from manure management: other	CH ₄	10	100	10	100	0	
4D1	Direct N2O emissions from agricultural soils	N ₂ O	10	60	5	28	0	378.5
4D3	Indirect N2O emissions from nitrogen used in agriculture	N ₂ O	50	200	16	40	0	611.6
4D2	Animal production on agricultural soils	N ₂ O	10	100	20	25	0	30

Note: comparison was not always possible due to differences in levels of aggregation

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Conclusions

- The Netherlands only country of the three that performed both Tier 1 and Tier 2 uncertainty assessment
- It could be investigated why uncertainties of Denmark and Germany are substantially lower
- Reporting and transparency can be improved:
 - Using tables
 - Making background documents available
- Emission factors could be compared to those of other countries
- Other documents are needed to perform a more in-depth comparison of QA/QC plans and methodology for estimating uncertainty, probably best organized via bilateral meetings between countries.

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Thank you

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Workshop SenterNovem, November 4, 2009

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Document:	Assessment of uncertainties and QAQC procedures in the Dutch GHG Inventory report
Last saved:	March 18, 2010
Author:	Paul Blinde